

Application No.: 10/034,030

Docket No.: JCLA8482

REMARKS**1. Present Status of the Application**

Claims 26 and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Araki et al. (US 5,855,711). Claims 27-29, 33, 34, 37-39, 42 and 43 are rejected under 35 U.S.C 103(a) as being unpatentable over Araki et al. (US 5,855,711). Claims 1-5 and 11-12 are rejected under 35 U.S.C 103(a) as being unpatentable over Araki et al. (US 5,855,711) in view of Watanabe et al. (US 6,326,561). Claims 6-10, 13-14, 30-32 and 35-36 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Upon this response, claims 1-14 and 26-43 remain pending in the present application.

2. Response To Objections/Rejections

Applicants respectfully traverse the rejections for at least the reasons set forth below.

Response To Claim Rejections Under 35 U.S.C. Section 102

As originally recited, independent claims 1, 26, 37 and 40 respectively recite below:

1. A method of fabricating a ceramic substrate with a thermal conductive plug of a multi-chip package, wherein the method comprises:
 - providing a plurality of green tapes;
 - forming* a plurality of conductive openings and *thermal conductive openings* passing through the green tapes;
 - after forming* the conductive openings and the *thermal conductive openings*, *filling a metal paste into* the conductive openings and the *thermal conductive openings*;
 - after filling the metal paste into* the conductive openings and the *thermal conductive openings*, *stacking the green tapes together*, wherein the metal paste inside the conductive openings of every green tape is in contact with its neighboring metal paste within the conductive openings of the green tapes, the metal paste inside the thermal conductive openings of each green tape is in contact with its neighboring metal paste inside the thermal conductive openings;
 - after stacking the green tapes together*, *cofiring those green tapes and the metal paste* to form a pre-substrate, wherein the pre-substrate comprises an insulating structure, a plurality of thermal conductive plugs and conductive plugs, the insulating structure is formed by cofiring the green tapes so that a plurality of conductive plugs are formed by cofiring the metal paste in the conductive openings and a plurality of thermal conductive plugs are formed by cofiring the metal paste inside the thermal conductive openings, the pre-substrate further comprises a top surface

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and a bottom surface;

forming a first metal film on the top surface of the pre-substrate;

forming a second metal film on the bottom surface of the pre-substrate;

patterning the first metal film to form a plurality of die pads and conductive traces, the die pads in contacted with the thermal conductive plugs and the conductive traces in contacted with the conductive plugs;

adhering a plurality of chips on the die pads; and

electrically connecting the chips to the conductive traces.

26. A method of fabricating a ceramic substrate with a thermal conductive plug, comprising:

providing a plurality of green tapes;

forming a plurality of thermal conductive openings passing through the green tapes;

after forming the thermal conductive openings, filling a metal paste into the thermal conductive openings;

after filling a metal paste into the thermal conductive openings, stacking the green tapes together, wherein the metal paste inside the thermal conductive openings of the green tapes is in contact with its neighboring metal paste inside the thermal conductive openings;

after stacking the green tapes together, cofiring those green tapes and the metal paste to form a pre-substrate, wherein the pre-substrate comprises an insulating structure, at least a thermal conductive plug, the insulating structure is formed by cofiring the green tapes and the thermal conductive plug is formed by cofiring the metal paste inside the thermal conductive openings;

forming a metal film on the pre-substrate; and

patterning the first metal film to form at least a die pad, and the die pad is in contact with the thermal conductive plug.

37. A method of fabricating a ceramic substrate with a thermal conductive plug, comprising:

providing a plurality of green tapes;

forming a plurality of thermal conductive openings passing through the green tapes, wherein a maximum width of the thermal conductive openings is approximately between 20 milli-inches and 40 milli-inches;

after forming the thermal conductive openings, filling a metal paste into the thermal conductive openings;

after filling the metal paste into the thermal conductive openings, stacking the green tapes together, wherein the metal paste inside the thermal conductive openings of the green tapes is in contact with its neighboring metal paste inside the thermal conductive openings; and

cofiring those green tapes and the metal paste.

40. A method of fabricating a ceramic substrate with a thermal conductive plug, comprising:

providing a plurality of green tapes;

forming a plurality of thermal conductive openings passing through the green tapes;

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after forming the thermal conductive openings, filling a metal paste into the thermal conductive openings;

after filling the metal paste into the thermal conductive openings, stacking the green tapes together, wherein the metal paste inside the thermal conductive openings of the green tapes is in contact with its neighboring metal paste inside the thermal conductive openings; and

after stacking the green tapes together, cofiring those green tapes and the metal paste to form a pre-substrate, wherein the pre-substrate comprises an insulating structure, at least a thermal conductive plug, the insulating structure is formed by cofiring the green tapes and the thermal conductive plug is formed by cofiring the metal paste inside the thermal conductive opening.

(emphasis added)

Applicants respectfully assert that the methods claimed in the present invention patentably distinguishes over Araki et al. (US 5,855,711), because Araki fails to disclose these features emphasized above (in bold).

One of the features of the present invention is characterized in that "before cofiring, thermal conductive openings are formed through green tapes and a metal paste is filled into the thermal conductive openings". However, Araki fails to disclose the above feature. In the Office Action (Paper No. 4), Examiner considers that the structure 51 in Fig. 4 of the citation by Araki can be readable as thermal conductive openings, but Araki discloses that the reference number 51 indicates "conductor" (See Col.5, line 67). Araki fails to disclose that the conductor 51 is used to heat dissipation and fails to disclose that the heat generated by a chip can be transmitted to the ambient through the conductor 51. Therefore, Araki fails to disclose that before cofiring, thermal conductive openings are formed through green tapes and a metal paste is filled into the thermal conductive openings. Applicants respectfully traverse the rejection under 35 U.S.C. 102 (a).

Response To Claim Rejections Under 35 U.S.C. Section 103

Applicants respectfully assert that the method claimed in the present invention patentably distinguishes over the disclosures by Araki and by Watanabe, because the disclosures fail to disclose these features emphasized in claims 1, 26, 37 and 40 (in bold).

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✓ One of the features in accordance with the present invention is that before cofiring, thermal conductive openings are formed through green tapes and a metal paste is filled into the thermal conductive openings. However, all of the disclosures by Araki and by Watanabe fail to teach, suggest or hint the above feature. It should be noted that Araki fails to disclose that the conductor 51 is used to heat dissipation and fails to disclose that the heat generated by a chip can be transmitted to the ambient through the conductor 51. Accordingly, Applicants consider that the conductor 51 can not be identified as thermal conductive openings or a metal paste filled in the thermal conductive openings. Therefore, even though the disclosures by Araki and by Watanabe are combined, the subject matters claimed in the present invention can not be attained.

For at least the foregoing reasons, Applicants respectfully submit that independent claims 1, 26, 37 and 40 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 2-14, 27-36, 38-39 and 41-43 patently define over the prior art as well.

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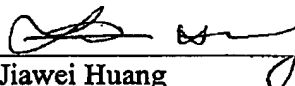
CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims 1-14 and 26-43 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted,



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